EXHIBIT A

EXHIBIT A

TR 72565
Issue 2, December 1996

Bell Atlantic Technical Reference

Basic Unbundled Loop Services Technical Specifications

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Bell Atlantic Network Services, Inc.
Technical Reference

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Bell Atlantic
Basic Unbundled Loop Services
Technical Specifications

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1. General

1.01 This document provides the technical specifications for the Basic Unbundled Loop Services (BULS) offered by Bell Atlantic in the co-carrier section of local exchange tariffs.

1.02 This technical reference has been reissued to provide a revised leakage specification and to provide interface code information. In addition, several editorial changes have been made.

1.03 BULS enable Other Telephone Companies (OTC) collocated in a Bell Atlantic (BA) Central Office (CO) to connect to analog subscriber loops to provide loop-start switched access services to end-user locations.

1.04 The technical specifications in this document assume that the OTC is collocated in the same CO as the BULS loop. In the future, Bell Atlantic may offer transport services for analog unbundled loops, however such transport will not be available for BULS. In instances where an OTC desires transport for a loop-start analog unbundled loop, the OTC must order Analog Unbundled Loop Service with Customer Specified Signaling (AULSCSS) and specify loop-start signaling. The technical specifications for AULSCSS may be found in BA TR72570.

2. Service Description

A. General

2.01 The description, terms and conditions, rates, regulations, and Universal Service Order Codes (USOCs) for Basic Unbundled Loop Services are contained in applicable tariffs or contracts.

2.02 Basic Unbundled Loop Services (BULS) provide the customer with a voice grade transmission channel suitable for loop-start signaling and the transport of analog voice grade signals. The channel is between the Central Office Distributing Frame (CODF) termination of OTC equipment in a BA Central Office (CO) and the Rate Demarcation Point (RDP) at an end-user customer location.

2.03 BULS is provided subject to availability on a first-come first-served basis. Special construction charges apply when appropriate facilities are not available.

B. Physical Characteristics

2.04 The interface at the CODF termination is 2-wire and the interface at the RDP is 2-wire. At each interface one conductor is called tip and the other conductor is called ring. A typical BULS configuration is shown in Figure 2-1.

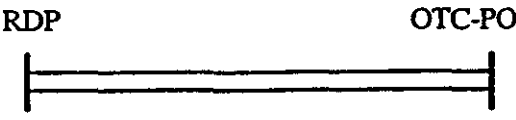

Figure 2-1: Typical BULS configuration

2.05 The transmission channel between the BULS 2-wire interfaces is effective 2-wire. An effective 2-wire channel may be entirely 2-wire or it may contain a 4-wire facility portion (such as a Digital Loop Carrier) with a 2-wire metallic extension to the end-users RDP. The transmission channel is suitable for the transport of analog voice grade signals between approximately 300 and 3000 Hz.

2.06 BULS may be provided using a variety of loop transmission technologies, including but not limited to, metallic cable, metallic cable based digital loop carrier, and fiber optic digital loop carrier systems.

2.07 When digital loop carrier (DLC) is used to provide BULS, the DLC will provide loop-start signaling at the RDP that meets the network requirements in ANSI T1.401-1993 [1].

C. Service Elements

2.08 BULS ordinarily consists of two elements:

(1) the CODF wire and tie cable(s) between the CODF termination of the collocated OTC equipment and the CODF termination of a subscriber loop; and,

(2) a subscriber loop facility between the CODF and the end-user customer's RDP. The loop is either:

(a) a metallic facility consisting of cable and wire between the CODF and the RDP; or,

(b) a universal DLC channel with loop start (LS) signaling capability. The DLC channel consists of:

- CO cabling between the CODF and a DLC Central Office Terminal (COT) equipped with a LS open-end channel unit;

- a fiber or metallic facility from the DLC COT to the DLC Remote Terminal (RT) equipped with a LS closed-end channel unit; and,

- cable and wire between the DLC RT and the RDP.

D. Compatibility Considerations

2.09 BULS utilizes subscriber loop facilities that have been designed for Plain Ordinary (analog) Telephone Service (POTS). In most cases, BULS should be suitable for loop-start single line residential service and loop-start single line business service. POTS qualified loops may not be suitable for data or other special services however.

2.10 Bell Atlantic does not guarantee that BULS will be suitable for analog data (e.g., V.32, V.32bis, V.34, etc.). If a customer is able to send and receive data, Bell Atlantic will not guarantee a data rate.

2.11 Special services such as Centrex, Foreign Exchange, Secretarial, and Wide Area Telephone Service lines may have service requirements that are more stringent than POTS. If such services are provided using BULS and electronic transmission and signaling enhancement equipment is required to meet the more stringent requirements, the OTC will be responsible for providing such enhancement equipment.

2.12 Bell Atlantic will work with the OTC to resolve facility problems should the BULS loop facility require enhancement equipment to support loop-start POTS voice service.

3. Element Specifications

A. General

3.01 Two elements are always used with Basic Unbundled Loop Services. They are: CODF wire and tie cable(s), and subscriber loop facilities. A third element, electronic transmission and signaling enhancement equipment, is sometimes used with BULS. The following sections contain the specifications for each of these elements.

B. CODF Wiring and Tie Cable(s)

3.02 CODF cross-connect wiring and tie cable(s) are used to link the CODF termination of co-located OTC equipment to the CODF termination of metallic subscriber loops, DLC COTs, and electronic transmission and signaling enhancement equipment.

3.03 The total combined length of all CODF cross-connect wiring and all CODF-to-CODF tie cables between the CODF termination of the OTC equipment and the CODF termination of any subscriber loop in the same CO should be less than 1500 feet.

3.04 The direct-current resistance between the CODF termination of the OTC equipment and the CODF termination of any subscriber loop in the same CO should be less than 80 ohms. This is equal to 1500 or less feet of 24 gauge cable.

3.05 The 1kHz loss measured on the CODF wiring and tie cables when measured between 900 ohm impedances should be .5 dB or less.

3.06 The C-message noise measured on the CODF wiring and tie cables shall be 20 dBrnC or less.

C. Subscriber Loop Facilities

3.07 Subscriber loop facilities consist of feeder and distribution plant between the CODF and the end-user customer's RDP. Feeder plant uses a variety of transmission technologies, including but not limited to, twisted-pair metallic cables, twisted-pair metallic cable based digital loop carrier, and fiber optic based digital loop carrier. Distribution plant usually consists of multipair metallic cables. Additional information about subscriber loops may be found in Bellcore SR-TSV-002275 [2] and appendix A of this document.

3.08 A twisted-pair metallic loop facility consists entirely of metallic cable and wire between the CODF and the end-user customer's RDP. Most metallic loops consist of multipair cables, laid out on aerial, underground, or buried routes to suit the needs of a particular community. The metallic loop facility may be loaded or non-loaded. It may also have bridged-tap. Loaded bridged-tap and bridged tap between load coils are not permitted.

3.09 A universal DLC facility consists of CO cabling between the CODF and a DLC COT, OSP fiber or metallic cable facilities from the DLC COT to the DLC RT, and cable and wire between the DLC RT and the end-user customer's RDP. Some DLC may not support enhanced services such as distinctive ringing, forward disconnect, caller ID, etc.

3.10 Subscriber loop facilities have been designed on a global basis primarily to accommodate POTS and guarantee that loop transmission loss is statistically distributed and that no single loop exceeds the signaling range of the CO.

3.11 Prior to 1980, loops were designed using one of the following design plans: Resistance Design (RD), Long Route Design (LRD), or Unigauge Design (UD). From 1980 to 1986, the Modified Resistance Design (MRD), Modified Long Route Design (MLRD), and Concentrated Range Extension with Gain (CREG) plans were applied on a going-forward basis (i.e., retroactive redesign was not implemented). In 1986, the Revised Resistance Design (RRD) plan was applied on a going-forward basis. Appendix A provides a summary of the various loop design plans.

3.12 Most metallic loop facilities (98%) were designed using the RD, MRD, or RRD design rules. The RRD design rules currently in use limit the loop resistance to the design range of the CO switch (1300 or 1500 ohms) or 1500 ohms whichever is less. The 1 kHz loss of RRD loops is 8.5 dB or less.

3.13 A small number of loops have been designed using the LRD, MLRD, UD, and CREG design plans. These loops are long (15+kft) and have high resistance (up to 2800 or 3600 ohms) and high loss (up to 13 dB without gain). Such loops require electronic transmission and signaling range enhancement equipment to accommodate POTS. The LRD and MLRD design plans use Range

Extension with Gain (REG) equipment that is either dedicated to each loop or hard-wired to the BA CO line equipment. In the latter case, the hard-wired REG is not available for use with BULS.

3.14 The REG equipment used with CREG designed loops is implemented behind a stage of switching concentration in the associated CO switch. This permits REG equipment to be shared with other loops working out of the same CO switch. For this reason, the REG associated with CREG designed loops is not available for use with BULS. Bell Atlantic will work with the OTC to explore available options when an LRD, MLRD, or CREG designed loop requires enhancement to support BULS.

3.15 The direct-current resistance of a metallic loop facility measured between the CODF and the RDP shall be 1520 ohms or less if the facility was designed using RD, MRD, or RRD rules. The resistance will be 2500 ohms or less if the facility was designed using UD rules, 2800 ohms or less if the facility was designed using CREG or MLRD rules, and 3600 ohms or less if the facility was designed using LRD rules.

3.16 The 1kHz loss of a metallic loop facility when measured with a 900 ohm impedance at the CODF and a 600 ohm impedance at the RDP shall be 8.5 dB or less if the loop was designed using RD, MRD, or RRD rules. The loss will be 10 dB or less if the loop was designed using LRD or MLRD rules, and 13 dB or less if the loop was designed using UD or CREG rules.

3.17 The C-message noise measured on a metallic subscriber loop at the RDP shall be less than 30 dBrnC.

3.18 The leakage resistance between the tip conductor and ground and the ring conductor and ground shall each be greater than 100 K ohms.

3.19 The longitudinal noise or power influence (PI) measured per IEEE Std 743-1984 [3] on the metallic portion of a loop should be less than 90 dBrnC.

3.20 The longitudinal balance of a metallic subscriber loop is defined as the longitudinal noise (in dBrnC) minus the C-message noise (in dBrnC). The longitudinal balance shall be >50 dB.

3.21 DLC facilities shall provide a battery feed to the RDP. When the RDP is terminated by a direct-current resistance of 430 ohms or less, the loop current shall be 20 mA or greater.

3.22 The 1kHz loss of a DLC facility when measured with a 900 ohm impedance at the CODF and a 600 ohm impedance at the RDP shall be 8 dB or less.

3.23 The C-message noise measured on a DLC facility shall be 23 dBrnC or less.

3.24 The C-Notched noise measured on a DLC facility shall be 36 dBrnC or less with a -13 dBm0 1004 Hz holding tone.

3.25 The impulse noise measured on a DLC facility shall be no more than 15 counts in 15 minutes with a threshold of 59 dBrnC.

3.26 Subscriber loop facilities shall meet all applicable design specifications. (See appendix A)

3.27 The echo return loss and singing return loss of a subscriber loop facility measured with a 900 ohm + 2.16 uf reference at the CODF and a 600 ohm + 2.16 uf termination at the RDP shall be equal to or greater than 5.5 dB and 2.5 dB respectively.

D. Transmission and Signaling (T&S) Enhancement Equipment

3.28 Transmission and signaling (T&S) enhancement equipment is sometimes used with BULS. Several different types of T&S equipment can be used. Examples are: transmission repeaters; loop signaling repeaters; and signaling battery boost equipment.

3.29 T&S equipment is often used with BULS loops designed to LRD, MLRD, UD, and CREG rules. Such devices are often called Range Extenders with Gain (REGs).

3.30 The impedance of T&S equipment shall be a nominal 900 ohms when used in the CO and a nominal 600 ohms when used at or near the RDP.

3.31 T&S equipment shall provide 20 mA or more of loop current when the RDP is terminated by a direct-current resistance of 430 ohms or less.

3.32 The C-message noise measured on T&S equipment shall be 20 dBrnC or less.

3.33 The C-Notched noise measured on T&S equipment shall be 36 dBrnC or less with a -13 dBm0 1004 Hz holding tone.

4. Service Specifications

4.01 The overall end-to-end BULS service is from the CODF termination of the OTC equipment to the end-user customer's RDP. The compatible BULS Network Channel Interface (NCI) code combination is shown in Figure 4-1.

Figure 4-1: Compatible BULS NCI Code Combinations

EU-POT	OTC-POT
02LS2	02QC3.OOD

4.02 Parameters are tested at the RDP in response to trouble reports or when additional testing is purchased.

4.03 Acceptance Limits (AL) and Immediate Action Limits (IAL) are shown in Figure 4-2 for loops designed to RD, MRD, and RRD rules. The resistance and loss parameters of loops designed to LRD, MLRD, UD, and CREG rules are in Appendix A.

Figure 4-2: BULS Acceptance Limits (AL) and Immediate Action Limits (IAL)

PARAMETER	AL	IAL
1004 Hz Loss	< 8.5 dB	> 10.0 dB
Resistance	< 1520 ohms	> 1520 ohms
Leakage	> 100 kilohms	< 100 kilohms
C-Message Noise	< 30 dBrnC	> 30 dBrnC
Power Influence	< 90 dB	> 90 dB
Loop Current (DLC only)	> 20 mA	< 20 mA

5. OTC Equipment and CO Cabling Requirements

A. OTC Equipment Requirements

5.01 Co-located OTC equipment used for interconnection with BULS shall meet all of the applicable generic equipment requirements in Bellcore GR-63-CORE [4] and Bellcore GR-1089-CORE [5].

5.02 Co-located OTC equipment used for interconnection with BULS shall be manufactured in accordance with FCC, NEC, UL, and USDL requirements and orders applicable to Federal, State, and local requirements including, but not limited to, statutes, rules, regulations, orders, or ordinances, or otherwise imposed by law. Requirements that are not specified in this document, contractual technical requirements, or other applicable documents, shall meet the manufacturer's requirements consistent with industry standards.

5.03 The open circuit tip-to-ring dc voltage that collocated OTC equipment applies to BA VF cabling shall be less than 80 Vdc.

5.04 Co-located OTC equipment shall not deliver more than 2.5 watts of power to any load via BA VF cable.

5.05 Co-located OTC equipment shall not deliver more than 150 mA of loop current to any load via BA VF cable.

5.06 The noise limits for BULS require collocated OTC equipment to have a longitudinal balance of >60 dB.

5.07 The loss and noise limits for BULS require collocated OTC equipment to have a nominal impedance of 900 ohms.

5.08 The applied power level of any transmitted signal on BULS averaged over 3 seconds shall not exceed -13 dBm0.

5.09 Loops may be exposed to electrical surges from lightning and commercial power system disturbances. Despite protective devices on the CODF, some of these disturbances are likely to reach OTC equipment. OTC equipment shall be designed to withstand certain surges without being damaged, and shall fail in a safe manner under infrequent high stress.

5.10 The prevalent voltage-limiting device available for CO use is the 3-mil carbon block. This device has an upper 3c limiting voltage of 1000 volts peak under surge conditions and 600 volts rms (800 peak) at 60 Hz. OTC equipment connected to BULS loops protected by carbon blocks may be subjected to voltages up to these levels. Unexposed COs may not have primary protection, and OTC equipment not coordinating with carbon blocks may need protection in these locations.

5.11 If the subscriber loop facility is exposed to commercial ac power, the CO protector may also include 350 mA heat coils for limiting the current that is permitted to flow to CO equipment. In addition, a protective fuse cable located outside the CO incorporating 24 or 26 AWG conductors to coordinate with the protector, serves to limit current to safe levels in the event of prolonged operation of the protector during power fault conditions.

B. OTC Equipment CO Cabling Requirements

5.12 The voice grade CO cabling used to terminate OTC equipment on the CODF shall use twisted-pair conductors.

5.13 The type, gauge, and length of the OTC CODF cabling shall be specified based on this specification and OTC equipment requirements. If the specifications in this document differ from the OTC equipment manufacturers specifications, then the more stringent of the two shall be used.

5.14 The direct-current resistance of the CO cabling between the OTC equipment and the CODF shall meet the CO cabling requirements in the Bellcore FR-TSY-000064 [6] (i.e., 23 ohms or less). This is equivalent to 275 feet or less of 26 gauge cable, 440 feet or less of 24 gauge cable, and 700 feet or less of 22 gauge cable.

5.15 All CO cabling between OTC equipment and the CODF shall be equipped with connectors at each end. The type of connectors shall be specified by the BA CO Engineer.

5.16 The 1kHz loss of the CO cabling between the OTC equipment and the CODF, when measured between 900 ohm impedances, shall be less than .15 dB.

5.17 The C-message noise measured on the CO cabling between the OTC equipment and the CODF shall be 20 dBmC or less.

6. References

A. Definitions

Basic Unbundled Loop Services (BULS)
A basic unbundled loop service is a service that provides a basic untreated or unconditioned loop-start channel between the Bell Atlantic central office distributing frame termination of collocated equipment belonging to an OTC and the rate demarcation point at a customer location.

Battery Boost
A series aiding battery source that extends the signaling range of current sensing equipment.

Bridged tap
Any branch section of a cable pair, or any extension of a cable pair beyond the point where it is used, in which no direct current flows when customer equipment is connected and used.

Central Office (CO)
A telephone company building which houses equipment and facilities used to provide switched access services.

Central Office Distributing Frame (CODF)
Framework located in a CO that holds wire cross-connects which are used to interconnect cable terminations for end-user customer loops, switching system ports, and inter-office facilities.

C-Message Noise
The frequency-weighted, short-term average noise within an idle channel. The frequency weighting, called C-message, is used to account for the variations in 500-type telephone set transducer efficiency and end-user annoyance to tones as a function of frequency.

C-Notched Noise
The C-message frequency-weighted noise on a channel with a holding tone that is removed at the measuring end through a notch (very narrow band) filter.

Channel
An electrical, or photonic communications path between two or more points of transmission.

Closed End
The end of a switched access service that receives ringing and dial tone and transmits address signals.

dBm
A unit for expression of power level in decibels relative to one milliwatt.

dBm0
Power level referred to, or measured at, a zero transmission level point (0TLP).

dBrn
A unit used to express noise power relative to one picowatt (-90 dBm).

dBrnC
Noise power measured with C-message weighting expressed in dBrn.

dBrnC0
Noise power in dBrnC referred to, or measured at, a zero transmission level point (0TLP).

Decibel (dB)
The logarithmic unit of signal power ratio most commonly used in telephony. It is used to express the relationship between two signal powers, usually between two acoustic, electric, or optical signals; it is equal to ten times the common logarithm of the ratio of the two signal powers.

Facilities
Any cable, poles, conduit, microwave, or carrier equipment, central office distributing frames, central office switching equipment, computers (both hardware and software), business machines, etc., utilized to provide the services offered by a telephone company.

Impulse Noise
Any momentary occurrence of noise on a channel that significantly exceeds the normal noise peaks. Impulse noise is analyzed by counting the number of occurrences that exceed a threshold.

Leakage
The resistance between the conductors of an insulated metallic pair or the resistance between each conductor of an insulated metallic pair and ground.

Loop
A transmission channel between a end-user customer location and a BA CO that is used as a transmission channel for telephone company services.

Loop-start (LS) Signaling
A type of switched access line signaling in which the network provides a battery source. To initiate a call, customer premises equipment will provide a loop closure that causes dc loop current to flow which the network will detect.

Open End
The end of a switched access service that transmits ringing and dial tone and receives address signaling.

Other Telephone Company (OTC)
An organization that provides telecommunications services to the public.

Plain Ordinary Telephone Service (POTS)

The basic single line switched access service offered by local exchange carriers to residential and business customers. POTS uses loop-start signaling.

Power Influence (PI)
The power of a longitudinal signal induced in a metallic loop by an electromagnetic field emanating from a conductor or conductors of a power system. PI is also called longitudinal noise or noise-to-ground.

Rate Demarcation Point (RDP)
The point at which Bell Atlantic network access recurring charges and responsibility stop and beyond which customer responsibility begins. The RDP is the point of demarcation and/or interconnection between a Bell Atlantic subscriber loop facility and end-user premises cabling or terminal equipment. Bell Atlantic facilities at, or constituting, the rate demarcation point shall consist of wire or a jack conforming to Subpart F of Part 68 of FCC rules.

Signaling Repeater
Loop enhancement equipment that detects and regenerates signaling states.

Transmission Repeater
Loop enhancement equipment that amplifies and equalizes voice frequency signals.

Unbundled Business Loop Service
The product name for a basic unbundled loop service offered in BA-MD.

Unbundled Loop
A transmission channel between a end-user customer location and a LEC CO that is not a part of, or connected to, other LEC services.

Voice Grade (VG)
A term used to describe a channel, circuit, facility, or service that is suitable for the transmission of speech, digital or analog data, or facsimile, generally with a frequency range of about 300 to 3000 Hz.

B. Acronyms

ANSI	American National Standards Institute
BA	Bell Atlantic
BULS	Basic Unbundled Loop Service
CO	Central Office
CODF	Central Office Distributing Frame
COT	Central Office Terminal
CREG	Concentrated Range Extension with Gain
DLC	Digital Loop Carrier
EU	End User
EU-POT	End User Point Of Termination

FCC	Federal Communications Commission
IEEE	International Electrical and Electronic Engineers
LRD	Long Route Design
LS	Loop-Start
MLRD	Modified Long Route Design
MRD	Modified Resistance Design
NEC	National Electric Code
OTC	Other Telephone Company
OTC-POT	Other Telephone Company Point Of Termination
PI	Power Influence
POTS	Plain Ordinary Telephone Service
RD	Resistance Design
RDP	Rate Demarcation Point
REG	Range Extender with Gain
RRD	Revised Resistance Design
RT	Remote Terminal
T&S	Transmission and Signaling
UD	Unigauge Design
UL	Underwriter's Laboratory
USDL	United States Department of Labor
VF	Voice Frequency
VG	Voice Grade

7. Bibliography

1- ANSI T1.401-1993, American National Standard for Telecommunications - Interface Between Carriers and Customer Installations - Analog Voicegrade Switched Access Lines Using Loop-Start and Ground-Start Signaling.

2- Special Report SR-TSV-002275, Issue 2, BOC Notes on the LEC Networks - 1990. Bellcore; 1991.

3- IEEE Std 743-1984, IEEE Standard Methods and Equipment for Measuring the Transmission Characteristics of Analog Voice frequency Circuits.

4- Generic Requirements GR-63-CORE, Network Equipment-Building System (NEBS) Requirements: Physical Protection, Issue 2, (Bellcore, October 1995).

5- Generic Requirements GR-1089-CORE, Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment, Issue 2 (Bellcore, November 1994).

6- Technical Reference FR-NWT-000064, LATA Switching Systems Generic Requirements (LSSGR), (Bellcore, 1994).

NOTE: These documents are subject to change; references reflect the most current information available at the time of printing. Readers are advised to check the status and availability of all documents.

Appendix A: Loop Design Rules

1- Resistance Design (RD): (96% of loops designed prior to 1980)
- 0 - 1300 ohms, 8.5 dB max
- Max BT on NL cable = 6 kft
- POTS = No loading to 18 kft, H88 loading beyond 18 kft
- CENTREX = No loading to 11 kft, H88 loading beyond 11 kft
- Max end section plus BT = 15 kft
- No loaded BT, No BT between load coils.

2- Long Route Design (LRD): (3% of loops designed prior to 1980)
- 1301 - 3600 ohms, 10 dB max
- Applicable > 18 kft, full H88 loading
- Gain required for loops over 1600 ohms
- Max end section plus BT = 12 kft
- No loaded BT, No BT between load coils.

3- Unigange Design (UD): (1% of loops designed prior to 1980)
- 0 - 2500 ohms, 13 dB max
- No loading to 24 kft, partial H88 loading beyond 24 kft
- Gain applied to loops > 15 kft
- Max BT on NL cable = 6 kft
- End section plus BT = 12 kft
- No loaded BT, No BT between load coils.

4- Modified Resistance Design (MRD): (1980 - 1986)
- 0 - 1500 ohms, 8.5 dB max
- Max BT on NL cable = 6 kft
- Total NL cable plus BT = 15 kft
- POTS = No loading to 15 kft, full H88 loading beyond 15 kft
- CENTREX = No loading to 11 kft, H88 loading beyond 11 kft
- Loaded cable end section plus BT = 3 to 12 kft
- No loaded BT, No BT between load coils.

5- Modified Long Route Design (MLRD): (1980 - 1986)
- 1501 - 2000 ohms = Res Zone 18
- 2001 - 2800 ohms = Res Zone 28
- RZ 18 = Range Extension plus 3 dB of gain, 10 dB max
- RZ 28 = Range Extension plus 6 dB of gain, 10 dB max
- Full H88 loading
- End section plus BT = 3 to 12 kft
- No loaded BT, No BT between load coils.

6- Concentrated Range Extension with Gain (CREG): (1980 - 1986, 1A & 2A ESS Only)
- 0 - 2800 ohms, 13 dB max
- No loading to 15 kft, full H88 loading beyond 15 kft
- Range extension with gain (REG) required for all loops over 1500 ohms
- REG provided behind a stage of switching concentration
- Total NL cable plus BT = 15 kft max
- Max NL cable BT = 6 kft
- Loaded end section plus BT = 3 to 12 kft
- No loaded BT, No BT between load coils.

7- Revised Resistance Design: (after 1986)
- 0 - 18 kft = 1300 ohms max
- 18 - 24 kft = 1500 ohms max (CO permitting)
- No loading to 18 kft, full H88 loading between 18 - 24 kft
- Max NL cable plus BT = 18 kft
- Max BT on NL cable = 6 kft
- Loaded cable end section plus BT = 3 to 12 kft
- No loaded BT, No BT between load coils.